

LOVELL et al
Appl. No. 10/535,333
February 12, 2009

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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method of effecting cross-linking of a resin comprising generating vinyl sulfonyl moieties *in situ* with the resin, said vinyl sulfonyl moieties then undergoing a reaction which effects cross-linking of the resin wherein the vinyl sulfonyl moieties are generated as a result of loss of a liquid carrier for the resin to be cross-linked.

2. (Cancelled)

3. (Currently Amended) A method as claimed in claim 2 1 wherein evaporation of the liquid carrier causes generation of the vinyl sulfonyl moieties.

4. (Previously Presented) A method as claimed in claim 1 wherein cross-linking results from reaction of the vinyl sulfonyl moieties with nucleophilic groups in the resin composition.

5. (Original) A cross-linkable resin composition comprising

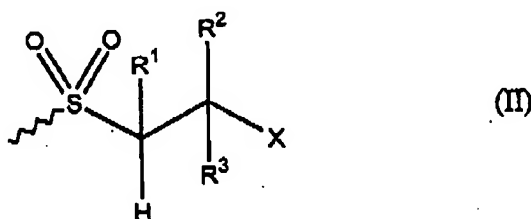
- (i) a polymer to be cross-linked;
- (ii) a liquid carrier for the polymer;

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- (iii) nucleophilic groups; and
- (iv) vinyl sulfonyl precursor groups capable of generating vinyl sulfonyl groups on loss of liquid carrier from the composition

at least one of the groups (iii) and (iv) being attached to the polymer to be cross-linked whereby loss of the liquid carrier results in generation of a vinyl sulfonyl moiety to effect cross-linking of the polymer,

wherein the vinyl sulfonyl precursor groups are of the formula (II)



where X is a leaving group, generation of the vinyl sulfonyl moiety results from loss of HX from the vinyl sulfonyl precursor groups, R¹, R² and R³ are hydrogen atoms, and
~~~~~ can be a chemical bond to carbon or heteroatom functionality.

6-10 (Cancelled).

11. (Currently Amended) A composition as claimed in claim 5 wherein the leaving group X is selected from groups of the formula -OR<sup>4</sup>, -OC(O)R<sup>4</sup>, -NR<sub>2</sub><sup>4</sup>, -SR<sup>4</sup>, -NCOOR<sup>4</sup> or -OSO<sub>3</sub>R<sup>4</sup> where R<sup>4</sup> is hydrogen, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aryl group, or X is F, Cl or Br.

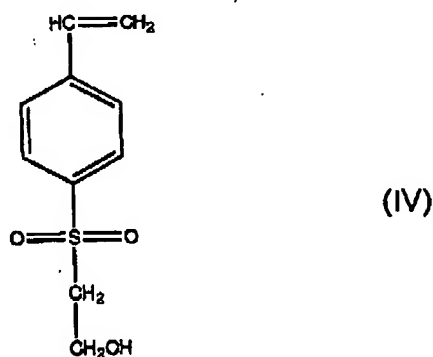
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12. (Original) A composition as claimed in claim 11 wherein X is of the formula  $-OR^4$ .
13. (Original) A compositions as claimed in claim 12 wherein  $R^4$  is hydrogen.
14. (Original) A composition as claimed in claim 12 wherein  $R^4$  is methyl or ethyl.
15. (Currently Amended) A composition as claimed in claim ~~6~~ 5 wherein the liquid carrier for the polymer to be cross-linked has the formula HX.
16. (Previously Presented) A composition as claimed in claim 5 wherein the vinyl sulfonyl precursor groups are attached to the polymer chains to be cross-linked.
17. (Original) A composition as claimed in claim 16 wherein the polymer to be cross-linked comprises 0.5 to 25% by mole of the vinyl sulfonyl precursor groups.
18. (Original) A composition as claimed in claim 17 wherein the polymer to be cross-linked comprises 1 to 10% by mole of vinyl sulfonyl precursor groups.

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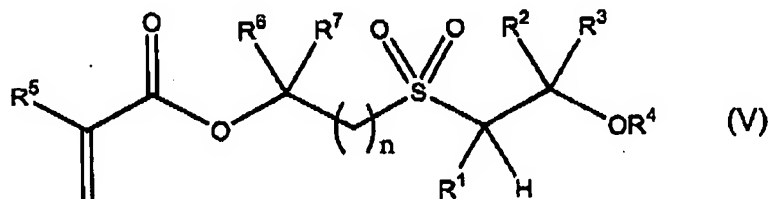
19. (Original) A composition as claimed in claim 18 wherein the polymer to be cross-linked comprises 3 to 7% by mole of vinyl sulfonyl precursor groups.

20. (Previously Presented) A composition as claimed in claim 16 wherein the polymer incorporating the vinyl sulfonyl precursor groups is a co-polymer of a compound of formula (IV)



with other olefinically unsaturated monomers.

21. (Previously Presented) A composition as claimed in claim 16 wherein the polymer incorporating the vinyl sulfonyl precursor groups is a co-polymer of a compound of formula (V)



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in which  $R^1$ - $R^3$  are as defined in claim 7,  $R^4$  is as defined in claim 11,  $R^5$ ,  $R^6$  and  $R^7$  are independently hydrogen or methyl, and  $n$  is a positive integer.

22. (Original) A composition as claimed in claim 21 where  $R^4$  is hydrogen, methyl or ethyl.

23. (Previously Presented) A composition as claimed in claim 5 wherein the nucleophilic groups are selected from  $-OH$ ,  $-SH$  and  $-NHR^8$  where  $R^8$  is hydrogen, substituted or unsubstituted alkyl (preferably  $C_{1-4}$  alkyl), or a substituted or unsubstituted aryl, group.

24. (Previously Presented) A composition as claimed in claim 5 wherein the nucleophilic groups are acetoacetoxy groups.

25. (Previously Presented) A composition as claimed in claim 5 wherein the nucleophilic groups are attached to polymer chains to be cross-linked.

26. (Original) A composition as claimed in claim 25 wherein the polymer to be cross-linked comprises 0.5 to 25% by mole of the nucleophilic groups.

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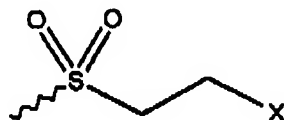
27. (Original) A composition as claimed in claim 26 wherein the polymer to be cross-linked comprises 1 to 10% by mole of the nucleophilic groups.
28. (Original) A composition as claimed in claim 19 wherein the polymer to be cross-linked comprises 3 to 7% by mole of the nucleophilic groups.
29. (Previously Presented) A composition as claimed in claim 5 wherein the polymer to be cross-linked is dissolved in the liquid carrier.
30. (Previously Presented) A composition as claimed in claim 5 in the form of a latex comprising a continuous aqueous phase and a discontinuous particulate phase of the polymer to be cross-linked, said polymer having attached thereto said vinyl sulfonyl precursor groups and said nucleophilic groups.
31. (Original) A composition as claimed in claim 30 wherein the polymer to be cross-linked has been obtained by copolymerisation of comonomers including vinyl sulfonyl precursor groups, comonomers including nucleophilic groups and optionally additional monomers.
32. (Original) A composition as claimed in claim 31 wherein the polymer incorporates said additional monomers which are selected from (meth)acrylic acid, itaconic acid, C<sub>1-20</sub> (e.g. C<sub>1-8</sub>) alkyl esters of these acids, vinyl acetate, vinyl versatates, styrene, butadiene, and combinations of the aforesaid monomers.

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33. (Original) A composition as claimed in claim 32 wherein the additional monomer is selected from vinyl acetate, butyl acrylate, 2-ethylexyl acrylate and butyl methacrylate.

34. (Original) A latex comprising a continuous liquid phase and a discontinuous phase of a film-forming polymer incorporating

- (iii) nucleophilic groups; and
- (iv) groups of the formula (I)



(I)

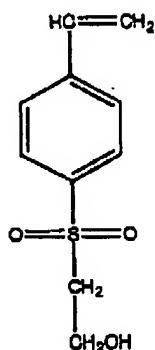
where X is a leaving groups and  represents a chemical bond to a carbon or heteroatom, whereby loss of liquid results in generation of a vinyl sulfonyl moiety by loss of HX on the groups of formula (I) and cross-linking of the polymer by reaction of this vinyl sulfonyl and the nucleophilic groups.

35. (Original) An emulsion as claimed in claim 34 wherein the polymer comprises 1 to 10% by mole of the groups of formula (I) and 1 to 10% by mole of the nucleophilic groups.

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36. (Previously Presented) A latex as claimed in claim 34 wherein the polymer has been obtained by emulsion polymerisation of

(A) a compound of formula (IV)



(IV)

(B) a hydroxyalkyl (meth)acrylate (e.g. hydroxyethyl acrylate, hydroxyethyl methacrylate, hydroxypropyl acrylate, hydroxypropyl methacrylate), 2-acetoacetoxyethyl acrylate or 2-acetoacetoxyethyl methacrylate ; and

(C) at least one additional monomer.

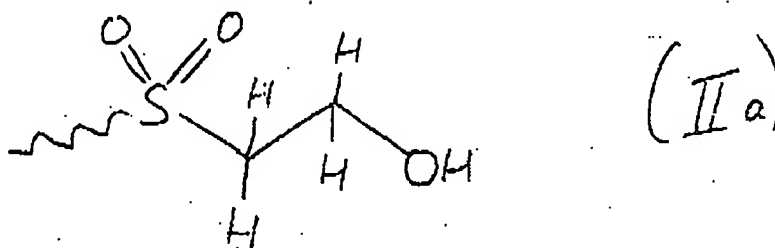
37-38 (Cancelled).

39. (Previously Presented) A method of effecting cross-linking of a resin comprising generating vinyl sulfonyl moieties *in situ* with the resin, said vinyl sulfonyl moieties then undergoing a reaction which effects cross-linking of the resin wherein cross-linking results from reaction of the vinyl sulfonyl moieties with nucleophilic groups in the resin composition.



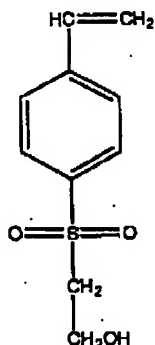
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40. (New) A cross-linkable latex resin composition comprising a polymer to be cross-linked in the form of particles in a continuous aqueous phase as liquid carrier for the polymer particles, said polymer incorporating nucleophilic groups attached to the polymer chain and further incorporating vinyl sulfonyl precursor groups attached to the polymer chain, said vinyl sulfonyl precursor groups being of the formula (IIa)



wherein loss of carrier water results in generation of vinyl sulfonyl moieties to effect cross-linking of the polymer.

41. (New) A composition as claimed in claim 40 wherein the polymer is a co-polymer of a compound of formula (IV)



with other olefinically unsaturated monomers.